A METHOD OF PREVENTING SURFACE ROUGHENING DURING HYDROGEN PREBAKE OF SIGE SUBSTRATES

ABSTRACT

The invention forms an epitaxial silicon-containing layer on a silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface and avoids creating a rough surface upon which the epitaxial silicon-containing layer is grown. In order to avoid creating the rough surface, the invention first performs a hydrofluoric acid etching process on the silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface. This etching process removes most of oxide from the surface, and leaves a first amount of oxygen (typically 1×10^{13} - 1×10^{15}/cm^2 of oxygen) on the silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface. The invention then performs a hydrogen pre-bake process which heats the silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface sufficiently to remove additional oxygen from the surface and leave a second amount of oxygen, less than the first amount, on the silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface. The heating process leaves an amount of at least 5×10^{12}/cm^2 of oxygen (typically, between approximately 1×10^{13}/cm^2 and approximately 5×10^{13}/cm^2 of oxygen) on the silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface. By leaving a small amount of oxygen on the silicon germanium, patterned strained silicon, or patterned silicon-on-insulator surface, the heating processes avoid changing the roughness of the silicon germanium, patterned strained silicon, or patterned thin silicon-on-insulator surface. Then the process of epitaxially growing the epitaxial silicon-containing layer on the silicon germanium, patterned strained silicon, or patterned silicon-on-insulator surface is performed.